

IN THE CLAIMS

1. [currently amended] A head end apparatus for a cable television operator, comprising:

one or more inputs for receiving streams of compressed MPEG data packets and/or Internet Protocol (P) packets encoding a plurality of video programs and/or other services provided by servers coupled to said one or more inputs;

one or more transmitters, transceivers or modems, each having an output coupled to a downstream transmission medium and an input for receiving a stream of packets containing data encoding one or more programs and/or services and any other data to be used with said programs and/or services; and

a pull multiplexer coupled to receive upstream program and/or service requests and to receive said one or more streams of compressed data packets from said one or more inputs, and having one or more data outputs at each of which is output a stream of data packets containing data encoding one or more requested video programs and/or services provided by servers coupled to said inputs, each said data output being coupled to an input of one of said one or more transmitters, transceivers or modems via a recoding circuit, said pull multiplexer including a programmed computer to map one or more requested programs and/or services to program identifier codes, P addresses or other identifying information that can be used by one or more culling switches that are part of said pull multiplexer to cull out data packets from said streams of compressed data packets received at said one or more inputs that contain data encoding said requested program(s) and/or service(s);

24 and wherein each said recoding circuit comprises circuitry to receive
 25 MPEG, P and other packets culled out by said pull multiplexer and information
 26 regarding the available bandwidth on the downstream channel and to
 27 decompress the data in said packets and recompress said data to a more
 28 compressed state if necessary to meet available bandwidth in the downstream
 29 medium.

1 2. [cancelled]

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1 3. [original] The apparatus of claim 1 wherein said pull multiplexer includes culling
 2 switch circuitry to select data packets defining one or more output data streams for
 3 transmission on one or more logical channels such that one or more subchannels carry
 4 data encoding popular programs and/or services that are to be transmitted downstream
 5 regardless of whether there are any current program and/or service requests for said
 6 popular programs and/or services and to output said data packets defining said one or
 7 more popular programs and/or services at said data output.

1 4. [currently amended] The apparatus of claim 1 wherein said pull multiplexer
 2 ~~further~~ comprises means for receiving upstream requests for video programs and
 3 services from users and for controlling upstream transmissions by implementing a log-in
 4 procedure to authenticate users so as to make sure upstream requests come only from
 5 users who have valid subscriptions. ~~bandwidth management to insure that said output~~
 6 ~~stream(s) of data packets at said one or more data outputs do not consume more~~
 7 ~~bandwidth than is available on said downstream transmission medium.~~

1 5. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises means for managing said output streams for maximum efficiency in transmitted
3 requested programs and/or services so that as many requests as possible from as many
4 customers as possible can be fulfilled.

1 6. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises means for assembling data packets that comprise said output streams such
3 that all the data packets that encode requested programs and/or services and associated
4 data to be viewed and/or used at any particular customer premises are transmitted to
5 said customer on a number of logical channels equal to or less than the number of tuners
6 said customer has.

1 7. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises a programmed microprocessor that functions to optimize the assembly of
3 output streams of data packets by analyzing the number of requests for programs and/or
4 services received from each customer and the number of tuners each said customer has
5 and the current availability of subchannels on one or more logical channels and attempts
6 to creates said output streams of data packets so that all the data packets encoding the
7 programs and/or services each particular customer requested are transmitted on
8 subchannels on a number of logical channels that does not exceed the number of tuners
9 said customer has.

1 8. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises a programmed microprocessor that functions to optimize the assembly of
3 output streams of data packets by analyzing the number of requests for programs and/or

4 services received from each customer and the number of tuners each said customer has
 5 and the current availability of subchannels on one or more logical channels and attempts
 6 to creates said output streams of data packets so that all the data packets encoding the
 7 programs and/or services each particular customer requested are transmitted on
 8 subchannels on a number of logical channels that does not exceed the number of tuners
 9 said customer has including attempting to move or combine data being transmitted to
 10 other customers on other available subchannels of one or more other logical channels so
 11 as to make enough subchannels available on a number of logical channels equal to or
 12 less than the number of tuners each particular customer has such that all data of
 13 programs and/or services requested by that customer can be transmitted on a number of
 logical channels equal to the number of tuners said customer has.

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1 9. [currently amended] A head end for a cable TV system, comprising:
 2 a head end cherry picker multiplexer having a plurality of inputs for
 3 coupling to data paths to receive input MPEG packet data streams from one or
 4 more video servers, Internet Protocol (P) packets from wide area network
 5 servers, and/or packets from T-carrier interface circuitry or telephone company
 6 digital switches and having one or more outputs at each of which is generated an
 7 output data stream and further comprising culling means for receiving upstream
 8 requests for program(s) and/or service(s) received from one or more customers
 9 and mapping said upstream requests to program identifier codes, P addresses or
 10 other packet identifying information and for communicating said program identifier
 11 codes to said one or more video servers to cause them to output requested
 12 video-on-demand program data as an MPEG packet stream, said culling means
 13 using said packet identifying information to cull out packets from said ~~input~~ MPEG

14 packet streams in one or more culling switches to generate said one or more said
 15 output data streams;

16 a plurality of recoders, each having an input coupled to receive one of
 17 said output data streams and having an output, for decompressing the data in
 18 said output data stream and recompressing said data into a recompressed data
 19 stream having a bandwidth which is less than or equal to the available bandwidth
 20 on a subchannel on a data path to be used to to transmit said recompressed data
 21 stream and for outputting said recompressed data stream at said output;

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cont'd* 22 a bank of one or more cable modems, each cable modem coupled to an
 23 output of a said recoder multiplexer to receive a recompressed data stream
 24 generated from an ~~an~~ output data data stream assembled by said multiplexer and
 25 coupled to receive one or more management and control messages from said
 26 multiplexer indicating upon which subchannel(s) the data packets encoding one
 27 or more program(s) and/or service(s) are to be transmitted, each cable modem
 28 for modulating the different program(s) and/or service(s) in the subchannels
 29 encoded in the data packets of said output stream received from said multiplexer
 30 recompressed data stream onto the particular subchannels of particular logical
 31 channels designated in one or more said management and control messages
 32 received from said multiplexer so as to generate signals bearing the requested
 33 video program(s) requested by each user and which are transmitted to the cable
 34 modems of said users via a hybrid fiber coaxial cable system.

1 10. [original] The apparatus of claim 9 wherein said culling means includes a
 2 microprocessor programmed to receive upstream packet data other than requests for
 3 programs and/or services and route said upstream packet data to the appropriate wide

4 area network server and/or T-carrier interface circuitry or telephone company digital
5 switch.

1 11. [currently amended] The apparatus of claim 9 wherein said cable modems are
2 DOCSIS compatible. ~~further comprising bandwidth compression circuitry coupled to~~
3 ~~receive said output data streams from said culling means and alter the bandwidth if~~
4 ~~necessary in accordance with the available bandwidth on a downstream medium to~~
5 ~~which said head end cherry picker multiplexer is coupled~~

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1 12. [original] The apparatus of claim 9 wherein said culling means includes a
2 programmed microprocessor and stored data indicating how many tuners each customer
3 has to tune into requested or pushed programs and/or services, said microprocessor
4 programmed to analyze the number of requests received from each customer and the
5 number of tuners said customer has and the available bandwidth on a shared
6 downstream medium coupling said head end cherry picker multiplexer to all said
7 customers, and for performing said culling process in such a way as to transmit as many
8 requested programs and/or services as possible to each customer on a number of logical
9 channels that is equal to or less than the number of tuners said customer has to tune
10 said logical channel.

1 13. [currently amended] A head end multiplexer system for a central office of a
2 DSL system, comprising:
3 one or more video inputs for receiving MPEG packet streams of video data
4 from a video server;
5 one or more P inputs for receiving streams of P packets from a server,

6 router or gateway coupled to a wide area network;

7 one or more wideband inputs for receiving telephony packets containing
8 digital data from an interface to a wide band digital network such a T-carrier
9 system or X.25 packet network;

10 one or more POTS inputs for receiving plain old telephone service analog
11 signals from a POTS switch in a public service telephone network;

12 one or more upstream inputs for receiving upstream program and/or
13 service requests and upstream data;

14 one or more culling switch means for culling out MPEG packets received at
15 said video inputs, P packets received at said P inputs and said wideband inputs
16 in accordance with culling selection criteria given to said one or more culling
17 switch means and organizing the resulting culled packets into one or more output
18 streams of packets, each output stream containing the data encoding programs
19 and/or services requested by user(s) at one customer premises;

20 control means for processing upstream program and/or service requests
21 received from users at all customer premises and generating said culling selection
22 criteria for programs and/or services requested from each customer's premises
23 from said upstream program and/or service requests received from that
24 customer's premises, said control means also for generating management and
25 control messages for transmission to each customer premises indicating which
26 logical channel(s) and subchannel(s) on the DSL line coupled to said customer
27 premises on which the requested program(s) and/or service(s) will be found,
28 said control means also for generating management and control messages for
29 controlling which channels and subchannels on which each program and/or
30 service requested by a particular customer will be transmitted on a DSL line

31 coupling said head end multiplexer to said customer premises;
32 one or more DSL modems, each having an output for coupling to a DSL
33 line coupling said head end multiplexer to one customer premises and each having
34 one or more inputs for coupling to receive one of said output data streams from
35 said culling switch means and receive management and control messages for
36 transmission to the customer premises said DSL modem is coupled to via a DSL
37 line and to receive management and control messages for use by said DSL
38 modem to control the logical channel(s) and subchannel(s) said DSL modem will
39 use in transmitting data encoding said requested program(s) and/or service(s) to
40 said customer, and each DSL modem having an input for coupling to one of said
41 POTS inputs, and each DSL modem having one or more outputs coupled to said
42 upstream inputs of said control computer, each DSL modem having circuitry for
43 transmitting data encoding one or more requested and/or pushed program(s)
44 and/or service(s) on one or more channels of said DSL line;
45 and wherein said control means includes routing circuitry including a
46 microprocessor coupled to said upstream inputs for receiving upstream data
47 packets and programmed to analyze the destination of each upstream data packet
48 and route it to a WAN gateway or server or T-carrier interface circuitry.

1 14. [original] The apparatus of claim 13 wherein said control means includes
2 means for analyzing the number of tuners each customer has and the number of
3 requests each user has made and the bandwidth availability on a bidirectional channel
4 and a wideband channel of said DSL line and for generating said culling selection criteria
5 so that, as many times as possible, said requested program(s) and/or service(s) are sent
6 on a number of logical channels that do not exceed the number of tuners said customer